# Selected Free-Weight Exercises: Analyses and Recommendations

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You are undoubtedly aware that many popular free-weight exercises are considered to be contraindicated from an injury-prevention perspective. While some people can perform these exercises with apparent impurity, most of us eventually pay a price unless we make appropriate modifications in the exercise execution.

Before examining specific exercises, let me state that explosive exercise movements seem to carry a higher risk of injury than repetitions performed with more controlled movement speeds. Also, full-range exercise movements appear to provide more injury protection than partial range repetitions.

## Behind-Neck Pulldown

This exercise is intended to involve the latissimus dorsi, teres major, and biceps muscles. It is typically performed with a wide, overhand grip through a relatively short movement range (arms extended overhead to base of neck). When executed in this manner, I have three concerns with this exercise. First, the behind neck position requires a high degree of external shoulder rotation which can place excessive stress on the rotator cuff muscles (specifically the teres minor and infraspinatus). Second, the overhand grip twists the biceps muscles to a less effective position and thereby attenuates pulling power, reducing the resistance that can be used in this exercise. Third, the wide hand spacing generally limits the movement range to about 90 degrees of shoulder adduction, which is considerably less than the latissimus dorsi and teres major muscles can accommodate.

As a more effective and less risky alternative exercise, I recommend a medium spaced, underhand grip, front pulldown. This modification puts the shoulders into internal rotation with minimal stress on the

rotator cuff muscles. It also places the biceps in a straight line of contraction for greater pulling power, thereby permitting heavier weightloads and potentially better results. Finally, the movement range is increased to about 180 degrees of shoulder extension, essentially doubling the distance over which the latissimus dorsi and teres major muscles contract.

## Behind Neck Barbell Press

This exercise addresses the deltoids, triceps and upper trapezius muscles. However, the externally rotated shoulder position can cause problems for the teres major and infraspinatus muscles of the rotator cuff. Unfortunately, bringing the bar in front of the neck does little to change this situation, and may place more stress on the lower back due to the tendency to lean backwards during the pressing phase.

I suggest switching to dumbbells with a less pronated grip to reduce external shoulder rotation. You may also find that alternating dumbbell presses are less likely to promote backward leaning, and are therefore preferable from the standpoint of injury prevention.

## Dumbbell Fly

The dumbbell fly is designed to work the pectoralis major and anterior deltoid muscles through a relatively long movement range. However, due to leverage factors the effective resistance changes dramatically between the top and bottom positions. Let's assume that you are using 20-pound dumbbells, and performing the exercise with relatively straight arms. As you lower the dumbbells about 1 inch from the top position (arms over head) the effective resistance is approximately 20 inch-pounds and requires relatively low force from the target muscles. But, as you approach the bottom position (arms extended from sides), the effective resistance may be about 300 inch-pounds, which requires relatively high force from the target muscles.

To provide a more consistent resistance through the movement range, I prefer dumbbell bench presses over dumbbell flyes. In the bench press exercise, the dumbbells travel almost vertically, thereby avoiding resistance variations due to leverage changes.

## Barbell Bent-Over Row

This exercise activates the latissimus dorsi, teres major and biceps muscles as you pull the barbell from an arm-extended position to your

chest. However, due to the bent-over position, leverage factors place significant stress on the low back muscles. For example, performing bent-over rows with a 100-pound barbell can place up to 1000 inch-pounds of resistance force on the lumbar spine.

A safer means for doing bent-over rows is from a bench-supported position using a single dumbbell. By placing your left hand and left knee on a flat bench you support the lower back while performing dumbbell rows with your right arm, and vice-versa. Actually, if you pull your arm up close to your side (shoulder extension) you emphasize the latissimus dorsi and teres major muscles. However, if you pull your arm up away from your side (horizontal shoulder extension), you emphasize the posterior deltoid muscles.

## Barbell Incline Press

The barbell incline press strengthens the pectoralis major, anterior deltoids and triceps muscles, with approximately equal emphasis on each group. However, many adults have difficulty bringing the bar all the way to their chest without overstretching and overstressing the pectoralis major and anterior deltoid muscles. Although the range of safe and effective movement may be increased gradually, I advise against beginning with the bar to chest position in previously untrained adults. For most practical purposes, lowering the bar to a point 2 inches above the chest is a good recommendation for new trainees. If this range is well-tolerated, the bar may be lowered by _ inch every two weeks. Don't increase the weightload when you increase the movement range, as lowering the barbell further will increase the exercise difficulty due to less favorable leverage factors. Adults who experience discomfort or persistent delayed onset muscle soreness should decrease the movement range until they can perform the exercise without undesirable consequences.

Another alternative is to substitute dumbbells, which enable you to perform incline presses with less external shoulder rotation. Due to the less-restricted arm position dumbbell incline presses typically permit greater pain-free movement ranges.

As you carefully consider the purpose of various strength-training exercises, then weigh the benefits against the risks, you may identify other popular free-weight movements that could be modified for increased safety and effectiveness. Next issue, I will present analyses and recommendations for several machine exercises.

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